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POPULATION AGING AND ITS ECONOMIC COSTS:

A SURVEY OF THE ISSUES AND EVIDENCE

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Abstract

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The aging of the population is expected to result in substantial increases in the costs of maintaining health care and pension programs, and that is a source of widespread concern. However, a proper assessment requires that attention be given to *all* categories of government expenditure, including education and others associated with younger age groups, and not just those associated with the older population. It requires also that privately provided goods and services be considered, since their costs must be charged against the same national income as publicly provided ones. Beyond that, it is important to recognize that population change affects not only the demand side of the economy, but also the *supply* side -- the economy's productive capacity. An important conclusion is that while other influences will no doubt play a role, demographic effects by themselves are likely to cause government expenditure (all categories, all levels of government combined) to increase by no more than the rate of growth of the population, and by less than the rate of growth of the gross domestic product. Taking public and private costs together, and assigning appropriate weights to different age groups, the overall "dependency ratio" can be expected to remain at its current low level for another decade and a half or two decades, and then to rise as the baby boom generation retires in large numbers. However, the projected future ratio never reaches the levels of the 1950s and 1960s. Although the overall "burden" of population aging is manageable, major adjustments will be required in the coming decades, especially in the area of federal/provincial cost sharing. For the most part, though, the effects of population aging are predictable, slow, and some time off.

Population Aging and Its Economic Costs: A Survey of the Issues and Evidence[1]

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1. Introduction

The baby boom generation is now in middle age. In the next decade its oldest members will be taking early retirement. By 2031 all of its members will have reached the age of 65 and, if present trends continue, the fraction of the population 65 and over will be far greater than previously experienced in Canada, or indeed in any modern industrial nation. That prospect has given rise to major concerns about our ability as a society to meet the large anticipated additions to health care, pension, and other costs associated with the increase in the older population. A recent newspaper editorial is typical in stating that "Unless the next generation is prepared for an astonishing increase in the tax burden -- we doubt they are -- fundamental reforms are needed to the contribution requirements for social programs and pensions, as well as the level of benefits provided" (*Calgary Herald*, July 28, 1998). Even well-informed observers sometimes lapse into hyperbole and speak of such things as "the colossal challenges of our rapidly aging society" (Siegel, 1994, p. 425).

The purpose of this paper is to survey the literature, issues, and evidence relating to cost increases associated with the aging of the Canadian population. A balanced assessment of costs requires that attention be given to *all* publicly provided services -- not only those used in large measure by the elderly (such as health care), but also those associated with other ages (such as education, employment insurance, correctional services). A balanced assessment requires also that privately provided goods and services be considered, since whether provision is mostly through public or private channels is, in large measure, a matter of social preference and public policy; the costs must be charged against the same national income in both cases. Beyond that, it is important to recognize that population change affects not only the demand side of the economy, but also the

supply side. That is, it affects the nation's productive capacity as well as the ways in which the national product is used.

2. The Underlying Demographic Situation

Demographic prospects, in particular future changes in age distribution, are at the core of any discussion of the economic costs of population aging. Some major aspects of the unfolding demographic situation in Canada are summarized in Figure 1. The figure shows the percentage age distribution of the population in 1966, when the baby boom had just ended, and again in 1996, 30 years later when those born during the boom were (as a close approximation) in the age range 30 to 50. The change in age distribution over the three decades is striking. In 1966 more than 42 percent of the population were 'young' (under the age of 20); in 1996, only 27 percent were 'young', while the proportion in 'middle age' (20 to 64) had increased from 50 to 61 percent. By 2031 all of the boom generation will be in old age,[2] and it is projected that those 65 and over will account for roughly one out of every four members of the population (about twice the current proportion), that the median age will be 44 (compared to 25 in 1966), and that there will be 114 "old" for every 100 "young" (compared to 46 per 100 in 1966).[3]

There can be little doubt that the *proportion* of the population in old age will rise. It will be somewhat lower if immigration increases and somewhat higher if it decreases; it will be somewhat higher if mortality rates fall faster than anticipated in the projection, somewhat lower if they fall more slowly. But such factors can have only rather minor effects. A return to much higher fertility rates would have a more substantial effect, but even then the proportion would still be markedly higher than it is today. As one example, even if the total fertility rate were to increase to three births per woman by 2006 (something that appears very unlikely) and then to remain at that level, we project that the fraction old would still rise by half by the year 2031.

Population aging is a widespread phenomenon among developed countries and some international comparisons are helpful. The "elderly dependency ratios" in Figure 2 (based on OECD data and projections) show that the Canadian ratios, both historical and projected, resemble those of the US, which experienced a baby boom with magnitude and timing similar to the one in Canada. In contrast, the post-war increase in the fertility rate

was much more modest in the countries of the European Community as a whole (more a 'blip' than a 'boom') and their populations were already older; hence the EC elderly dependency ratios are noticeably higher than Canada's, both historically and for some three decades into the 21st century. Indeed, the EC ratio at the end of the 1990s is higher than Canada is likely to experience until after 2010. The situation in Japan provides another contrast since Japan had no baby boom, but rather a sharp decline in fertility following World War II. Its elderly dependency ratio, which was very low in the early post-war period, has been rising rapidly: it was higher than the Canadian ratio by 1980, higher than the US ratio by the early 1990s, higher than the EC ratio by the late 1990s, and is projected to be the highest among the OECD countries for the next three decades and beyond. The elderly dependency ratio in Canada is likely to increase rather little until after 2010, and then to continue to be lower than that of Japan and the EC, and slightly above that of the US. To the extent that this ratio is an indicator of prospective difficulties, we in Canada are relatively well positioned, by international standards.[4]

We turn now to the effects of demographic change on the labour force. The rapid population growth from the mid-1940s through the mid-1960s was reflected in rapid labour force growth, with a lag of some two decades to allow for the children of the baby boom to reach working age. A similar lag followed the baby bust; those children first reached working age in the latter part of the 1980s, and their smaller numbers have played an important role in the slowing of labour force growth in recent years.

The labour force is, of course, affected also by immigration. Most immigrants are of working age, and hence higher levels of immigration (unlike higher levels of fertility) can increase the size of the labour force immediately. In recent years immigration has come to be the predominant source of labour force growth, and that will almost certainly continue to be the case far into the future. Indeed, if immigration were reduced to zero, labour force growth would soon cease entirely, and would probably turn negative by the second decade of the next century. With immigration maintained at recent levels, the labour force is expected to grow more rapidly than the population for another decade or so before much slower growth sets in; based on our medium projection (see endnote 3), labour force growth will pretty much come to an end by the middle of the second decade of

the next century.

Changes in labour force participation rates are important too. Strong and sustained increases in female participation rates were a major contributor to labour force growth from the early 1950s through to the end of the 1980s; the higher female rates more than offset the declines in rates among older males that have been a prominent feature since the late 1960s. But growth from net increases in participation, it appears, has now come to an end also: female participation rates are unlikely to increase much further. All things considered, the labour force, like the population, is likely to experience a considerable amount of aging in the decades ahead. Our projections suggest that aging of the population and labour force, and associated reductions in their rates of growth, are all but inevitable. Figures 3 and 4 show the five-year rates of growth from 1951-56 through to 2036-41, based on our medium projection.

3. Dependency Ratios

Some of the discussion in the previous section was based on "elderly dependency ratios." However, the "dependency ratio" concept is more general, and sufficiently important in analyses of the effects of population aging to warrant special attention.

The "dependency ratio" is a simple but time-honoured measure of the (broadly speaking) economic implications of the structure of a population. The idea is that the population can be divided into two groups, one representing "dependents," the other representing "providers" or "working-age population." The ratio of the number of people in the first group to the number in the second is then taken to be an indicator of the degree of difficulty that a population has in supporting itself.

Shryock and Siegel (1975) provide two conventional definitions: they define the *age dependency ratio* as the ratio of the combined population 0-14 years of age and 65 and over to the population 15-64, and the *economic dependency ratio* as the ratio of the non-labour-force population to the labour force. Other definitions are possible, their appropriateness being defined by the context. We prefer a ratio such as the *total* population to the working-age population or the labour force, on the grounds that the total population represents the number of people to be supported, whether by themselves or by others, but there are many possible variations

on the basic theme.

The notion of a dependency ratio (however defined) implies a sort of pay-as-you-go economy. Within any year, those in the population who are the producers of wealth support those who are not. Absent is any concept of saving and capital accumulation, so that people who are "active" in one period of their lives might provide support for themselves in a later period, when they are old. Nor is there any allowance for productivity differences, so that the ability to provide economic support might increase through time, or might vary from country to country or region to region, even if the dependency ratio were the same. The dependency ratio idea does not fit neatly into an economist's way of thinking. Nevertheless, it is a useful measure for summarizing some of the implications of an age distribution. Moreover, it would seem to be implicit in much of the popular discussion of population aging -- of the future ability of the economy to support a large and increasing proportion of old people, and hence the implications for age-related government programs.

We and others have used conventional dependency ratio calculations of various kinds in analysing the historical and prospective implications of population aging in Canada; see, for example, Denton, Feaver, and Spencer (1987, 1997, 1998), Fellegi (1988), and Foot (1989). The calculations invariably reflect the high ratios attained in the 1950s and 1960s as a result of the large numbers of children born during the baby boom, the sharp declines during the subsequent baby bust, and the historically low levels of the 1990s. Our projected ratios, based on alternative plausible demographic assumptions, indicate that the current low levels will be maintained for another decade or two, and then will start to increase as the proportion of people 65 and over rises steadily. In spite of the increases, though, the ratios projected over the next half-century are never as high as those of the postwar baby-boom period.

A criticism of such ratios is that dependents of different ages all have the same weight in the calculations: a child and an old person each count as one dependent with no allowance for possible differences in consumption or support requirements. Another criticism is that each provider is treated equally. Foot (1989) calculated a number of "non-standard" dependency ratios in which differential weights were employed and provision was made for labour force participation and unemployment rates that vary by age group. The focus in his paper was

the effect of population aging on government expenditure. His calculations went back to 1921 and as far forward as 2021. Taking account of labour force participation rates had some effects, but the largest effects on the projected ratios were introduced by the expenditure weights assigned to different age groups. Assigning a much higher weight to the older age group (65 and over) than to the youngest (under 15) produced future dependency ratios considerably higher than any historical ones by the year 2021.

In two recent studies we have taken account of age differences in *total* expenditure or consumption. That is to say, our concern has been with the effects of population aging on the total amount of consumption required by the population, whether financed privately (food, shelter, etc.) or by one or another level of government (publicly funded health services, police services, etc.). In Denton, Feaver, and Spencer (1998) we arbitrarily assigned alternative sets of weights to different age groups and calculated dependency ratios using both working-age population and labour force as denominators, and the age-weighted total population as numerator (the total number of consumers in the economy, weighted by the assumed per capita consumption levels in the various age groups). We found in that study (as in others) that the dependency ratios were all low in the 1990s, by historical standards, and all started to rise sharply after a decade or so into the next century. However, in order to obtain ratios that eventually (about half a century from now) exceeded those of the 1950s and 1960s it was necessary to assign to the old population a per capita consumption weight three times greater than that assigned to the young population. We argued that it was unlikely that the difference in per capita consumption would be so great, and therefore concluded that ratios that high would be unlikely to occur.

In Denton, Feaver, and Spencer (1997), we also focussed on the effects of population aging on total consumption (as indicated by historical and projected dependency ratios). However, this time we attempted to measure actual per capita levels by age group for a large number of individual consumption categories, privately and publicly funded combined. We did various calculations too using working-age population, labour force, and employment in the denominator. The ratios so calculated all were again low in the 1990s and changed very little for a decade and a half or two into the next century. They all started to rise thereafter, based on our population projections, and moved up substantially in the ensuing decades. But they did not reach the levels of the 1950s

and 1960s.

If we pool Foot's results and ours, what general conclusions can be drawn? The evidence indicates clearly that dependency ratios are very low in the 1990s and that they are likely to change little for another fifteen or twenty years. It indicates also that they will rise substantially thereafter as the proportion of elderly people in the population rises. The evidence differs somewhat with respect to how fast and how high the ratio will then increase, depending on how the calculation is done.

Weighted dependency ratios differ to some extent from unweighted ones in their projected time paths. Weights based on per capita government expenditure produce higher future ratios than weights based on a more comprehensive approach in which total per capita consumption levels are used. We are satisfied that consumption-based ratios as far into the future as the middle of the next century are unlikely to go as high as they did in the 1950s and 1960s. That, plus the fact that the ratios are likely to remain quite low for another two decades or so, should help to assuage fears about the impending "aging crisis." However, the specific effects on government expenditure receive further attention below.

4. Points of Impact of Population Aging on the Economy

We move now from demographic considerations to identification of the major relationships between the population and the economy. Our concern is with both *demand*, the ways in which aging of the population might affect patterns of expenditure (including the demands for publicly provided services), and *supply*, the ways in which it might affect the productive capacity of the economy.

Expressions of apprehension typically relate to the demand side, and specifically to the costs of maintaining the public health care and old age income security systems. The older population is projected to be two and one-half times as large in 2031 as in 1996. Roughly speaking, then, the cost of simply maintaining public programs for that population would also increase two and one-half times, in real (constant price) terms. Only by cutting per capita expenditure by sixty percent would the total outlay not increase.

Concerns with the effects of population aging frequently ignore some matters of importance. One is that while population aging will put pressure on some categories of government expenditure it will reduce the

pressure on others. That is because the proportion of young people will decline, with continued low fertility levels, and with proportionately fewer children one might expect less pressure (from demographic sources) on education expenditures; also, with proportionately fewer in the work force one might expect a reduction in expenditures associated with employment programs; and so on. In general terms, one might expect that the same demographic forces that will give rise to population aging will lead to expenditure decreases in some areas of public budgets that will at least partially offset the increases in others. It makes little sense to consider in isolation only those expenditure categories (such as health care and old age security) that might be expected to increase, and then to claim that there is a crisis. This matter is discussed in more detail later.

One might anticipate that changes in the age structure of the population would have far-reaching effects on the demand for goods and services provided by the private sector as well as those provided by the public sector. Broadly speaking, population aging might be expected to cause production to shift somewhat from goods and services associated primarily with children to those associated with people in middle or old age. To the extent that population growth alters the level and composition of consumer expenditure it is likely also to influence investment of various kinds, thereby extending its impact. Such shifts will take place mostly through market forces: producers will respond by producing more of what consumers want (and are willing to pay for) and less of what they do not want.

Another matter that is ignored in much of the public debate relates to the impact of population change on the productive capacity of the economy. Government budgetary cost increases associated with population aging are projected to take place over a period of several decades, and hence should be expressed not in dollar terms but relative to the productive potential of the economy, as measured by its national income, gross national product (GNP), or gross domestic product (GDP).

In addressing the matter of how population aging is likely to affect the longer term productive capacity of the economy, it is helpful to draw on the (highly simplified) relation $q = a + b\,l + c\,k$ which states that q, the rate of growth of the nation's output, is the sum of three factors: a, which can be interpreted as the rate of

productivity growth; l, the rate of growth of the labour force (assuming a constant rate of unemployment), weighted by labour's relative contribution to output, b; and k, the rate of growth of capital (the composite of machinery, equipment, and productive physical structures of all kinds), weighted by capital's relative contribution to output, c. The relative contribution weights sum to 1.0.

We start by considering the rate of labour force growth. The labour force is drawn from the population, of course, and so this is the most obvious point of impact of population aging on the economy. As already noted, the slower growth that comes with population aging is reflected in slower growth of the labour force, but with a delay. For example, those born in the latter part of the 1960s, at the beginning of the baby bust, reached labour force age in the latter part of the 1980s, and that played an important role in the relatively slow growth of the labour force at that time and subsequently. The continuing small numbers of births are a major source of the anticipated future slow growth of the population and labour force. (See Figures 3 and 4.)

We turn now to capital. The stock of capital grows as the result of investment. Investment, in turn, is related to the amount of saving, which conventional economic thought regards as reflecting life cycle considerations. Briefly put, people are assumed to accumulate assets (that is, save) during their working years and decumulate (dissave) during retirement. Thus one might expect that at present the baby boom would be in a phase of relatively high accumulation rates, and that high rates of aggregate saving would continue for another decade or so, but then start to fall. Based on conventional economic argument there is the prospect of a decline in the saving rate as the population ages, and hence in the rate of growth of the capital stock, and that would coincide with the slowing rate of labour force growth. That combination could, then, result in a slower rate of growth of the national income and product. All of this is based on more or less standard economic theory, and there are many ifs and buts attached to it. The argument does demonstrate, though, how population aging may affect the capacity to produce goods and services as well as the demand or requirements for those goods and services.

Consider, finally, the rate of productivity growth, a. This factor has usually been treated as exogenous -- that is, unrelated to other factors, including population change. (Whether it is in fact exogenous is open to

question.) In effect, the historical rates have usually been estimated residually (after accounting statistically for the contributions of labour and capital). On that basis, productivity growth has been very slow for the past two decades or more, well below the rates of the earlier postwar period. In the face of slower future rates of labour force (and possibly capital) growth, more rapid gains in productivity will be needed to maintain even modest increases in overall output per capita in the Canadian economy.[5]

5. Possible Offsets to the Effects of Population Aging

To the extent that it reflects population aging, productive capacity is likely to grow more slowly in the future. Could anything happen to offset this slower growth? More rapid productivity growth would certainly help, as we have noted. There are other possibilities too. The first is an increase in the level of immigration. The appeal of that idea stems from two considerations: immigrants are relatively young, and hence their arrival reduces the average age of both the population and the labour force; and they can be expected to add more to the national product than they use up as consumers, and thus to provide net support for the rising numbers of elderly dependents in the population.[6] On closer inspection, however, there is a problem: immigrants get older, like everyone else, and a *sustained* policy of higher immigration has little long-run impact on either the median age or the age composition of the population.[7]

An increase in fertility is a second possibility. Fertility is obviously less amenable than immigration to policy control. However, some have advocated pronatalist policies to counterbalance the effects of population aging, and the Government of Quebec has such a policy in place.[8] We note that an early return to fertility rates substantially higher than those experienced for the last quarter century would reduce somewhat the pace of aging, but not by much (Denton, Feaver, and Spencer, 1998; see also previous observations above). And while higher fertility rates would lead to faster labour force growth, that would not happen until some two decades after a new boom was under way. In the meantime the overall dependency ratio would be *higher*, not lower.

A third possibility has to do with participation in the labour force. The strong trend towards earlier retirement that has been evident among Canadian men since the late 1960s means both more dependents per person working and less productive potential, and hence (if the trend continues) more difficulty in supporting an aging

population. That raises two questions: (1) have the lower rates been, at least in part, an unintended result of social support programs and perhaps also of legislation relating to private pensions, in which case the underlying policies might be reviewed; and (2) have older workers who became unemployed tended to 'retire' early because they were not successful in obtaining other employment? Related to the second question, have older workers been persuaded to accept offers of early retirement, and hence effectively forced out of the labour force?

Such questions have received little research attention in Canada and definitive answers are elusive. Standard economic theory conceives of individuals making lifetime plans for their consumption, labour force participation, and retirement. If capital markets were perfect (so that individuals could borrow against all future income at the going rate of interest) the age-patterns of consumption (and saving) would be independent of the age-patterns of earnings, and thus independent of the age-patterns of work and retirement. In that context, the introduction of a public pension plan might have no impact on labour force participation: the contributions while the individuals were working would be reflected in the expected future receipt of benefits in retirement, so they might reduce private saving but labour force participation could be unaffected. Similarly, the introduction of an (actuarially fair) early retirement provision under such a plan need not have any effect on contributors. In practice, however, the situation is complex and the provisions of plans are likely to affect retirement planning. For one thing, the Canadian public old-age income security system is multilayered,[9] and will affect people in different income positions differently, in part because there is no earnings test on CPP/QPP benefits but there is an income test on OAS/GIS benefits.[10] Beyond that, of course, capital markets are not perfect, and it is difficult to borrow against future pension benefits. Thus individuals with relatively high rates of time preference may opt to choose the reduced benefits that go with early retirement. The provisions of private plans, including especially the earliest age at which retirement benefits are available, may be an important consideration too.

In Canada, two "natural experiments" have resulted from the separate but parallel existence of the CPP and QPP: the provisions of the two plans have been virtually identical in other respects, but (1) the retirement test for receipt of benefits was removed from the CPP in 1975 and from the QPP in 1977, and (2) the receipt of

reduced early retirement benefits before age 65 (in fact, as young as 60) became possible under the QPP in 1984 and under the CPP in 1987. Baker and Benjamin (1997a, 1998) exploited these two differences in an effort to assess whether key parameters of the plans could affect labour force attachment and, in particular, whether the parameters of the plans could "be set to compensate for the effects of demographic shifts, or to influence trends in labour market participation" (1997b, p. 8). With regard to the removal of the retirement test, they found sizable changes in retirement behaviour: fewer "retired" completely by withdrawing from the labour force. That suggests that high taxes on earnings for those in receipt of benefits (for example, through the reintroduction of a retirement test) might discourage labour force participation. With regard to the provision of early benefits, they did find an acceleration in the relative growth of those in receipt of retirement benefits in Quebec after 1984 and in Canada after 1987; however, there were no corresponding changes in the labour force behaviour of 60-64-year-old males, whose participation rates continued to fall to a similar extent in both jurisdictions. They concluded that "secular trends in retirement behaviour were driven more by fundamental factors than early retirement provisions of the public pension scheme" (1997b, p. 15).

An important possibility is that those "fundamental factors" include difficulties that older workers, once displaced, have in finding alternative employment. The problem may stem from a deficiency in aggregate demand, perhaps combined with an element of "ageism" (if employers prefer to hire younger workers). In the Canadian context, Osberg (1993) emphasises that poor labour market opportunities appear to be associated with retirement, a condition that he describes as constrained labour supply behaviour. Referring to the US context, Perachi and Welch (1994) argue that increases in Social Security benefits alone do not account for the trend in male labour supply; one candidate they identify is increased wage dispersion, with its associated declines in labour market opportunities for less skilled workers. In a more recent review, Gruber and Wise (1997) summarize the major results from an especially commissioned series of parallel studies relating to the impact of social security programs in eleven industrial countries, including Canada. They conclude that the provisions of social security programs themselves typically contribute to labour force withdrawal, and cite as the major reasons generous retirement benefits at young ages, large financial penalties on earnings beyond the early retirement age,

and the use of disability and unemployment programs which, in effect, provide early retirement benefits even before the official social security early retirement age. In the same volume, Gruber (1997) calculates the implicit tax rate in Canada on work for those who continue working beyond the age of early retirement eligibility. He finds that the rate depends very much on individual circumstances: for median-income married men with no asset income there is a modest tax on work through age 64, and fairly high levels thereafter, but the taxes are substantially lower for those with asset income and for single workers, and higher for low income workers. How those differences in implicit tax rates have influenced retirement behaviour has not been investigated, as Gruber notes. In the Gruber and Wise (1997) comparison of country studies, Canada stands in the middle group, based on a measure of unused labour capacity of males aged 55 to 65, but the fraction of average income replaced by social security benefits at the early retirement age (60 in Canada) is by far the lowest among the countries considered. Furthermore, all three of their measures of early retirement incentives implicit in the tax-transfer system (accrual in the year after early retirement, the implicit tax on earnings, and the 'tax force' from the early retirement age to age 69) appear to suggest that the Canadian social security system provides little incentive to take up early retirement, at least relative to most of the other countries considered.

Some older workers might like to phase in retirement, for example by working fewer days per week, fewer hours per day, or fewer weeks per year (with a commensurate reduction in earnings).[11] However, private pension plans generally encourage full rather than partial retirement, since retirement benefits are typically based on annual earnings averaged over the last three or five years of employment, and full retirement may be required for receipt of any retirement benefits.

These matters are of obvious interest and practical importance, in that the failure of the economy to accommodate in one way or another those who are willing and able to continue working when they are in their late 50s, in their 60s, or older, both increases the number of dependents per person working and reduces the productive potential of the economy. With continued aging of the population the problem of supporting a larger fraction in old age will be greater than necessary unless the services that older workers could provide are used.

Another issue relates to the level of aggregate saving. As discussed earlier, if saving in the economy is, in

significant measure, determined by life cycle behaviour, we might expect the aggregate saving rate to be lower in the future, when a larger fraction of the population is old. That suggests that if more were saved now (and invested productively) the large baby boom generation could share with future and smaller generations the costs of supporting itself in old age; specifically, saving more now would add to the aggregate capital stock, and thereby increase the future productive capacity of the economy. Feldstein (1974), in a famous article, connected a pay-as-you-go national pension scheme with a low national saving rate: current contributors might save less because they expect to receive benefits when they retire, but their contributions are, in fact, not "saved" but simply transferred to those currently retired. Hence there is an "illusion" of saving. Carrying that argument a bit further, the payment of similar retirement benefits in the future, when the boom cohorts retire, would require a significant increase in contribution rates (if the pay-as-you-go system were maintained), diversion of other expenditures, or possibly public sector dissaving if contribution rate increases were resisted.[12]

An additional problem stems from more than two decades of government deficit spending in Canada and many other industrial countries (OECD, 1998): deficit spending represents public dissaving. In combination with the Feldstein effect, then, both the public sector and the private sector were spending "too much" on current consumption and saving "too little" for the future, thereby reducing capital formation and shifting to later generations even more of the burden of supporting the baby boom generation in retirement.

It is a matter of contention whether saving is determined in significant measure by life cycle forces, as standard economic analysis assumes.[13] That is true too of the important question of whether public transfer systems, such as CPP/QPP, really do reduce the amount that is saved (and invested) and, if they do, by how much. Beyond that, there are questions relating to the effects of other aspects of our retirement income security system, such as the impact of RRSPs on the saving rate. Such questions are difficult to answer convincingly.[14] Nonetheless, there is strong support from many quarters for the early introduction or extension of measures designed to counter the anticipated future effects of population aging.[15] Such measures include increasing the rate of saving, both by eliminating deficits and reducing the national debt, and by diversifying the sources of retirement income to include less reliance on a public pay-as-you-go tax-transfer system through some combina-

tion of encouraging greater provision of private pensions and modifying public plans to put them more on a funded basis (OECD, 1998). Aaron, Bosworth, and Burtless (1989), for example, argue in favour of bringing the US old-age, survivors, disability, and hospital insurance (OASDHI) programs into actuarial balance, and using resulting surpluses to increase national saving. The US Advisory Council on Social Security (1997; see also Gramlich, 1996) supports measures that would "seek to achieve more advance funding of Social Security's long-term obligations" and "would result in a higher level of national saving" (p. 4). The World Bank (1994) would go much further; in what Slater (1995, p. 49) calls its "most startling recommendation," it would "replace second-tier public pay-as-you-go pension systems (such as the C/QPP) by mandatory retirement savings programs (like Registered Retirement Savings Plans)." Chand and Jaeger (1996), in a study for the International Monetary Fund, argue that the costs for developed countries of shifting to fully funded systems may be substantially higher than the costs of fixing the pay-as-you-go system. That is consistent with Slater's (1995, pp. 55-56) view that "the basic structure and scale of Canada's retirement income system is appropriate" but he too would favour reduced benefits and more "pre-funding" with the fund available for investment purposes, thereby adding to national saving and earning a market rate of return. Such thinking appears to have been shared by the federal Department of Finance, as reflected in the recent reform of the CPP. Support for debt reduction in anticipation of population aging is provided also by Oreopoulos and Vaillancourt (1998); using a generational accounting approach, they find that "with no further changes to the current path of fiscal policy, the consolidated government budget is on a sustainable track, but *only* if decision makers use projected budget surpluses to pay down the debt" (p. 3).[16]

A move towards pre-funding of future pension obligations could be through modifications of existing public plans (as suggested by Slater, 1995) or through partial or full privatization of plans (as suggested by the World Bank, 1994, and in two of the three approaches for reform identified by the US Advisory Council on Social Security, 1997). However, as Mitchell and Zeldes (1996) observe, under a reasonable set of assumptions such a move need not have any impact on national saving. Privatization would make the unfunded liability of public plans an explicit part of the national debt and the associated interest payments would represent "a transfer from

young to old which exactly replaces the transfer under the old, unfunded Social Security system. Only if fiscal policy were changed to make the debt shrink over time relative to the old implicit liability would national saving increase (as in Martin Feldstein, 1995)" (p. 366). Alternative assumptions about how the system works could lead to a greater predicted impact on national saving, but they conclude that "[w]e regard the likely effects on national saving ... as modest" (p. 367).

Other analysts disagree that increasing the national saving rate should be a priority. Cutler, Poterba, Sheiner, and Summers (1990) develop a model to explore how the demographic shifts associated with population aging "affect the economy's sustainable level of consumption, and how society should plan for these changes" (p. 16). They conclude that sustainable consumption *increases* in consequence of such aging, and that "an economy with otherwise optimal national saving would *reduce* (emphasis added) its saving in response to the upcoming demographic changes" (p. 16). Their analysis relates to a theoretical economy in which the consumption path is chosen "in accord with a standard optimal growth model" (p. 27), and they argue, based on their analysis with that model, that "for all plausible combinations of parameter values, the effects of reduced labour force growth and reductions in the numbers of children exceed the effects of increases in long-run dependency" (p. 28). Thus, they conclude, while there may be good reasons for wanting to increase the national saving rate, population aging is *not* one of them.

As noted earlier, one further possible direction for countering the effects of population aging is by raising the rate of productivity growth. Cutler et al. (1990, p. 3) observed, with reference to the US, that the eventual "decline in living standards caused by the increased dependence would be fully reversed by a 0.15 percent a year increase in productivity growth." That would represent a very modest increase. An argument for anticipating such a response is that slower labour force growth means that labour would become relatively scarce, and that might induce more rapid improvements in technology. Disney (1996) concludes, after an extensive review of the relevant literature that, at least, "There is no evidence of adverse effects of aging on aggregate productivity" (p. 307).[17]

In another study, Fougère and Mérette (1998) develop an endogenous growth overlapping-generations

model calibrated to the Canadian situation, in which they integrate pension programs (including tax-sheltered private pension plans) as well as programs relating to health and education. They find, among other things, that population aging may create strong incentives for future generations to invest in human capital (that is, to obtain more education). That in turn, they argue, would help to offset the potentially negative effects associated with reductions in the proportion of population of working age and the national saving rate, and might stimulate economic growth in the long run.

6. Population Aging and Government Expenditure

We focus our attention now on the specific impact of the aging phenomenon on government expenditures. Social security programs (OAS, GIS, CPP/QPP in Canada) and health care have received the most attention in the context of population aging.[18] A more general view would add education and family allowances/child tax benefits to the list, inasmuch as an aging population implies a declining proportion of children and young adults. But social security, health care, education, and family allowances/child tax benefits account for well under 40 percent of the combined budgets of governments at all levels.[19] Moreover, transfer expenditures such as OAS and CPP/QPP are taxable, so that a substantial portion is returned to the government treasury, and the net expenditures are thus significantly smaller than the gross or nominal ones. While other components of government expenditure are less obviously related to population aging they nevertheless are affected in one degree or another, and a proper assessment of effects on government budgets requires that all of them be considered. We have followed that path in a series of papers in the past two decades (Denton and Spencer, 1978, 1985, 1997; Denton, Feaver, and Spencer, 1986).

Our approach has been to consider each of a large number of expenditure categories individually and then aggregate the results. Each category is scrutinized to establish its likely sensitivity to changes in population size and age structure (health care expenditure is highly sensitive, national defence expenditure is quite insensitive). Choosing some base year, we make judgements about the proportion of expenditure in each category in that year that is population-sensitive and the proportion that is population-insensitive. We allocate the population-sensitive part to male and female age groups, using various indicator series where those are available (labour

force by age, school-age population, etc.), and judgement where they are not. We then ask the following question: Given a projection of the population, what level of expenditure (in real terms, i.e., at constant prices) would be required in each future year to maintain per capita expenditure in every age-sex group at its base-year level in every category, and by aggregation for all categories combined? We refer to the projected levels of expenditure as "constant quality" levels; they represent the *pure effects of population change*.[20]

The calculations just described have been carried out for consolidated expenditures by all levels of government combined and (in Denton and Spencer, 1985) for combined provincial/local government expenditures. Separate projections have been made for expenditures on goods and services (health care, for example) and for expenditures representing transfers to persons (OAS payments, for example). Denton and Spencer (1997) provide historical estimates of "constant quality" expenditures, expressed in index form with base value 100 in 1986, and projections of the indexes to the year 2031. The projections show social security expenditure (in real terms) increasing three-fold between 1986 and 2031, and publicly funded health care expenditures doubling. Those increases compare with a 50 percent increase in the total population, thus making clear some of the strong effects of the change in age structure. Education expenditures, on the other hand, increase by only 10 percent, a result almost entirely of changes in the age composition of the under-20 population since the total size of that group is projected to change hardly at all. Most of the other categories of expenditure are associated more or less with the population as a whole (e.g., national defence, general government services) or with the population 20-64 (e.g., correction and rehabilitation services, unemployment insurance, workers' compensation). The net result for all categories combined (both goods and services and transfer payments to persons) is a rate of growth of total expenditure that is just about the same as the overall rate of growth of the population.

But projections of population-induced changes in government expenditure tell only half the story. As we have emphasized previously, changes in the size and age structure of the population have effects not only on costs (private consumption requirements, government expenditure requirements) but also on the productive capacity of the economy -- the ability of the economy to meet the costs. We have therefore coupled our expenditure projections with projections of national output (gross national product or gross domestic product)

and projections of expenditures as percentage ratios to GDP are provided, along with the projections of expenditure themselves, in Denton and Spencer (1997); see also Denton and Spencer (1995). The projected ratios show the expected increases for health care and social security -- from 6.2 percent of GDP in 1991 to 8.9 percent in 2031 for the former, from 4.6 percent to 8.0 percent for the latter -- and the expected decrease for education, from 5.8 to 5.1 percent. Those three categories taken together rise from 16.6 percent of GDP to 22.0 percent over the forty-year period. However, total expenditure for *all* budgetary categories combined is projected to fall rather than rise over the forty-year period.

Summing up, the evidence indicates that the government expenditures necessary to maintain social security and health care at current per capita levels will rise in the coming decades (albeit slowly) as a consequence of population aging, as is widely anticipated, and that their rates of increase will exceed both the rate of growth of the population and the rate of growth of GDP.[21] But the evidence indicates also that those increases will be offset elsewhere in the budgetary framework, especially in education, but in other categories as well, and that the overall increase for all budgetary items combined will be at about the rate of growth of the population, and below the rate of growth of GDP. It seems clear that the main problem of public policy will be not how to deal with increased requirements for overall budgetary expenditure in relation to the nation's GDP, but rather how to effect shifts within budgets to accommodate rising demands of some kinds coupled with falling demands of others. We do not wish to minimize the difficulties in making such adjustments, especially within a federal framework in which different levels of government have jurisdiction for different categories of expenditure.[22] But the problem to focus on is how to make the adjustments, not how to deal with "huge" overall population-induced expenditure requirements. As Murphy and Wolfson (1991, p.25) observed, "Contrary to many popularly expressed concerns, demographic aging is not the most important factor in determining future public-sector costs and revenues. Rather, aspects of the design and management of public-sector programmes represent the greatest area of uncertainty. These areas are more amenable to public policy initiatives and gradual adjustments within the half century time-frame of the projections."[23]

It is worth noting that concerns about population aging and its effects on government budgets are wide-

spread internationally; see, for example, the United Nations publication edited by Stolnitz (1992) and recent OECD publications by Roseveare et al. (1996) and Turner et al. (1998). It is worth noting too, and stressing, that the expenditure effects of population aging are *slow*. Popular discussions of health care and social security "crises" often seem to suggest that population aging is the cause of today's difficulties. That is not so. The proportion of older people will certainly rise, but gradually, and to place the blame on it for perceived current problems is misleading.[24]

We conclude this section by drawing attention to a paper by Lee and Skinner (1998). It is concerned specifically with the impact of population aging on the US Social Security and Medicare trust funds. Among other things, it makes use of stochastic forecasts of mortality and fertility rates as well as productivity growth and real interest rates; that permits the authors to assign measures of confidence to the outcomes of simulated policy interventions, and to stress the inevitable uncertainty associated with long-term projections. As they observe, "Any reform, whether an increase in payroll taxes today, or a switch to private or government equity investments, cannot shield the Social Security and Medicare trust funds entirely from going dry." By way of illustration, they note that "even a 4 percentage point increase in the payroll tax leaves a 22 percent chance of the Social Security system going bankrupt by 2070." They argue that the inevitable uncertainty in long-term projections suggests that policy should remain flexible, and able to respond to changing circumstances. In the Canadian setting, for example, one intention of the recently legislated increases in contribution rates is to create a larger CPP fund than has existed in recent years. Inevitably the fund will not accumulate exactly as anticipated. Less rapid accumulation could occur because the outflows were greater than projected (perhaps because beneficiaries live longer than expected), or because inflows were less than projected, and the appropriate policy response might differ in the two cases.

7. Summary of Findings

(1) As the baby boom moves from middle age into old age, the population will grow older, on average: the median age will rise from 35 in 1996 to 44 in 2031, at which time all those born during the baby boom will have passed their 65th birthdays. It is projected that by 2031 a quarter of the population will be 65 or over,

and that there will be one person in that age range for every two in the labour force; such ratios are unprecedented, not just in Canada but internationally.

(2) The prospective aging of the population has given rise to concerns about our ability as a society to meet the resulting increases in health care, pension, and other costs associated with the elderly.

(3) It is important to recognize that population aging takes place *slowly*. The ratio of the total population to the population of working age is *low* today, by historical standards, and it will not change much for another fifteen or twenty years. The ratio will rise once the baby boom generation starts to retire in large numbers, but it will never go as high as in the 1960s when that generation was in its youth. The ratio of the elderly population to the working age population will likely be about the same in Canada as in the United States in the coming decades, and well below the levels reached in the European Community, and more especially Japan.

(4) The slower growth of the labour force that will accompany future population aging will have a direct and negative effect on the productive capacity of the economy: other things equal, the growth of productive capacity will be slower because of slower labour force growth. Some observers anticipate other negative effects too, resulting from reductions in the aggregate saving rate, and hence in the growth of the stock of physical capital, or from slower productivity growth associated with aging of the work force. Such effects are much more uncertain, though, than the apparently inevitable effects of slower labour force growth.

(5) What could happen to avoid population aging and its effects?

   (a) It is clear that immigration would not do the job, even at very high annual rates. Immigration will almost certainly be the most important source of labour force growth in Canada over the next few decades, and higher levels would certainly increase the size of the population and the labour force. But immigrants age like everyone else, and in the longer run immigration would have only a minor influence on the age distribution.

   (b) What about fertility? Fertility rates are obviously less amenable than immigration to policy control, but assuming they could be influenced in an upward direction, would that solve “the problem”? Again, the

answer is *no*. Much higher rates than those experienced for the last quarter century would certainly affect the age distribution, but the proportion of older people in the population would still rise substantially, and combined with it would be a larger proportion of child dependents.

(c) The rates of labour force participation have been trending down for older men for several decades, both in Canada and internationally. Observers generally agree that this trend is largely the result of individuals choosing to retire at earlier ages when they have the financial freedom to do so, and in that regard some of the provisions of pension plans may encourage earlier retirement. To the extent that the provisions of old age income security plans induce individuals to retire earlier than they would otherwise choose, there will be more pensioners (hence higher costs) and fewer workers (hence reduced national income or product from which to meet those costs). The evidence in this regard as it relates to Canada is not conclusive, however, and further study is warranted.

(d) What about the aggregate saving rate? The jury is still out as to whether population aging will in fact lower the rate of saving in the Canadian economy. Some have argued that the very nature of public pension systems reduces the national saving rate below what it would otherwise be, but the evidence is mixed, and there appears to be no consensus.

(e) Finally, what about productivity? Continued growth in productivity is conspicuously important, and it is recognized that a sustained increase in the rate, even a modest one, could outweigh any negative effects associated with aging. On balance, the relevant literature suggests that there is no reason to anticipate a reduction in productivity growth in consequence of population aging. Furthermore, there is the possibility that slower labour force growth will itself provide an incentive to achieve faster productivity growth, since labour will be more scarce.

(6) Expressions of apprehension about the effects of population aging typically relate to the *demand* side of the economy, and in particular to public expenditures on health care and old age security systems. Usually ignored is the fact that those same demographic forces will tend to *reduce* expenditures in some areas (such as education, employment insurance, correctional services), and also that CPP/QPP and OAS transfer

payments are taxable, and hence that the net cost of them may be significantly less than it appears to be if only the benefit payments are considered. In total, CPP/QPP, OAS, GIS, and health care expenditures account today for about a quarter of total (consolidated) government expenditures in Canada for all levels of government combined. Also largely ignored in the public debate is the impact of population change on the *supply* side or productive capacity of the economy, and hence on the ability of the economy to generate tax revenue to support higher expenditure levels.

(7) Our projections indicate that when a comprehensive view is taken of the impact of population aging on government expenditures, the *demographically induced* rate of growth of total expenditure is likely to be about the same as the overall rate of growth of the population. Furthermore, when projected expenditures are compared to the projected productive capacity of the economy, it seems likely that the total expenditure for all budgetary categories combined will be a *smaller* percentage of GDP in 2031 than in 1991, even though there will be large increases in expenditures on health care and social security. (Our projections relate to the effects of population change only; there may well be nondemographic influences that will raise or lower future expenditures, but that is another matter.)

8. Policy, Programming, Practical Implications

What are the policy, programming, or practical implications that follow from the observation that significant aging of the population will occur in Canada over the next few decades? What actions should governments take, now or in the future, to accommodate such aging or to offset its negative consequences?

Barring an unlikely return to much higher levels of fertility, and subject to the policy-controlled level of immigration, the changes in the population that will take place over the medium to longer term can be predicted now with some accuracy. There can thus be available an important and more or less reliable base of information which can (and should) be kept up to date, and used to support public policy debate and decision.

Population aging means progressively slower growth, not only of the population itself but also of the labour force. Such growth as occurs is likely to become increasingly dependent on immigration. In the five-year period 1991-96, for example, immigration accounted for almost half of the growth in the population and more than

70 percent of the growth in the labour force. The realization that immigration will be the most important determinant of population and labour force growth in the coming decades suggests to us the need for a carefully thought out immigration policy that takes a long-term view and pays attention to both social and economic considerations.

As a general principal, the planning of government expenditure programs involving the creation and use of specialized physical or human capital should be well informed as to prospective demographic changes. Schools, hospitals, and other structures built at public expense will last for decades; teachers, nurses, doctors, and others trained today may be in the labour force for 35 or 40 years. Funding policies and programs will be more solidly based if medium- to longer-term projections of population change and its effects on the economy and government budgets are available routinely, and are taken into account. We note the observation in the 1998 Report of the Auditor General of Canada to the House of Commons that "parliamentarians are left to make annual financial decisions, many of which have lasting consequences, without a macro perspective -- a summing up of the financial impacts that demographic change can potentially have on the government's long-term financial health" (Auditor General, 1998, p. 6-5). The Economic Council of Canada at one time provided medium- to longer-term economic projections and analysis, but was terminated in the 1980s. We think there is a need today for an agency with somewhat similar terms of reference that will have as its focus the more distant economic future, and in particular the anticipation of the effects of population aging. Basic demographic projections are available at the national and provincial levels from Statistics Canada and other sources, but regular careful study of their economic and government budgetary implications seems to be lacking. At the local level, where decisions about hospitals, schools, housing policies, etc., have immediate impact, there appears to be very little in the way of an organized demographic projection base on which to make informed judgements.

Population aging will have different impacts on different categories of public expenditure, and hence different impacts on federal, provincial, and municipal budgets; arrangements for appropriate revenue sharing therefore need to be worked out. Moreover, the effects of aging will be more pronounced in some regions than in others. Given the reality (and sometimes misunderstanding) of population aging, we emphasise the impor-

tance of planning on the part of governments at all levels to anticipate the program needs of their populations, and to avoid the wastage that comes from having in place surpluses or shortfalls of resources.

An important area for further study is the decline in the labour force participation of older men and the shift toward earlier retirement. The reasons for these trends are still not sufficiently clear, although the trends have been in evidence for a long time. The movement of older men out of the work force and into the "dependent" population is obviously a matter of some importance for assessment of the effects of population aging: it both increases the number of elderly dependents and reduces the capacity of the economy to support them. We would like to see the initiation of a substantial program of research to investigate the relevant issues, and in particular the role played by institutional rigidities in public and private pension plans. The tendency for men to retire earlier, in spite of increased life expectancy, seems to us to be a matter of considerable importance for pension policy and policies relating to the elderly generally.

ENDNOTES

1. This is a condensed version of a paper (Denton and Spencer, 1998c) that was prepared as part of the National Consensus Project, "Creating Evidence-Based Canadian Consensus of Health, Social, and Economic Issues Related to Seniors Independence," a project that was funded by the NHRDP. The authors alone are responsible for the paper's content and conclusions.

2. The definition of 'old' (65 and over) is conventional but arbitrary. Argument for revising it upward is given in Denton and Spencer (1998b).

3. Unless otherwise noted, the projection numbers reported here and subsequently draw on the 'medium' projection reported in Denton, Feaver, and Spencer (1998); however, that projection, which assumes a continuation of recent trends, has been updated to reflect additional information available at the time of writing.

4. It is of interest to note also the differences within Canada. The elderly dependency ratio is projected to be relatively high in the Atlantic Region and Quebec, relatively low in Ontario and the western provinces (Denton and Spencer, 1997). With their jurisdictional responsibilities for health care, those provinces with relatively high ratios may anticipate greater pressures in areas of public budgetary expenditure related to the older population.

5. The growth of average *labour* productivity (output per worker) in Canada was less than one percent per year for the decades 1976-86 and 1986-96, down from more than two percent in the two preceding decades. The causes of the slower productivity growth remain a matter of debate, but its importance for future increases in output per capita (and for coping with the costs of population aging) is apparent. We have calculated that one percent growth in per capita output could be achieved in the decade 1996-2006, even with a continuation of low productivity gains, but that to sustain one percent growth thereafter would require gains in productivity much greater than have been observed in the past two decades (Denton and Spencer, 1998a).

6. In a related context, Foot (1991) argued that "an age-directed immigration program could alleviate the problem of a 'bulge' in the age profile" (p. 71). Those who have argued in favour of more immigration into the US to offset low fertility rates include Simon (1989), Keely and Tran (1989), and Holzmann (1987). Serow, Sly, and Wrigley (1990), looking beyond the year 2030, are more cautious.

7. It can, of course, have a major impact on the *size* of the population. Denton, Feaver, and Spencer (1997) illustrate the demographic impacts of a wide range of immigration levels in the Canadian context. As Espenshade (1994, p.766) noted, "immigration is a clumsy and unrealistic policy alternative to offset a shortage of domestic labor or to correct a perceived imbalance in the pensioner/worker ratio in the United States and, by implication, in other countries with low fertility... [I]n the short run only substantially larger volumes of immigration than the United States has ever experienced have the potential to dampen current aging trends." That is consistent with our own findings for Canada.

8. Henripin (1994) carried out some calculations to investigate, among other things, the results of a policy to raise future fertility. He recognized the uncertainty as to whether such a policy would be effective, and the possible costs of it, but did not rule it out.

9. Burbidge (1996) provides a good account of the system.

10. As one example, even if the early retirement provisions of the CPP/QPP were actuarially fair, Baker and Benjamin (1997a) show that the reductions in benefits that go with early retirement are partly offset by higher GIS benefits after 65, at least for low income people. They conclude also that the expected present value of benefits is higher at age 60 and declines thereafter, thereby indicating a slight subsidy to early retirement (based

on average mortality rates). We note that continued reductions in mortality (this year's 60-year-olds can expect to live slightly longer than last year's) would cause the subsidy to increase year by year.

11. Hurd (1996, p.11), for example, states that "older workers often want to reduce hours of work to make a gradual transition into retirement."

12. In a more recent paper, Feldstein (1996, p.8) assesses the evidence as suggesting that "the Social Security program causes each generation to reduce its savings substantially and thereby to incur a substantial loss of real investment income." He goes on to argue that "even if each extra dollar of Social Security wealth displaces only 50 cents of private wealth accumulation, the loss of national income would exceed 5 percent of GDP."

13. In its *1997 Annual Report*, the US Council of Economic Advisers concludes that the "evidence ... suggests that demographics may not be as important a determinant of saving patterns as the theory suggests," and notes, among other things, the failure to document dissaving among the elderly, the low aggregate saving rate during the 1980s "even though the life-cycle model says that it should have risen because the increase in the proportion of the population in its prime saving years swamped the increase in the proportion that was old." (Relevant sections of the *Annual Report* are reproduced in the "Documents" section of *Population and Development Review*, Vol 23, No. 2, June 1997.) In the Canadian context, there is evidence to suggest that in fact older people continue to save as they grow older, contrary to what the life-cycle model predicts; see Burbidge and Davies (1994) and Lin (1997).

14. Burbidge, Fretz, and Veall (1998) argue that RRSPs do not account for the difference in the aggregate saving rates between Canada and the US, as claimed by Jump and Wilson (1986), Carroll and Summers (1987), Venti and Wise (1995), and Poterba, Venti and Wise (1996), among others.

15. Schieber and Shover (1996) provide a short overview of approaches that several countries have adopted to reform their social security systems.

16. With that proviso, however, we note that Kotlikoff and Leibfritz (1998) argue that Canada, alone among the 17 countries studied using the generational accounting approach, is "essentially in generational balance"; they comment further that "the world's leading industrial powers -- the US, Japan, and Germany -- all have severe imbalances in their generational policies" (pp. 19-20).

17. Disney does observe, however, that older workers find difficulty in obtaining employment and suggests that the problem may arise, in part, from a wage structure (including the deferred pay component, pensions) whose incentive effects are reduced by aging. In particular, the trend toward private pension plans with defined contributions (and away from those with defined benefits) may provide a better incentive device for firms with smaller proportions of younger workers covered by their plans (Disney, 1996, Ch. 5).

18. That is true in the US as well as Canada. See, for example, US Council of Economic Advisers (1996, 1997).

19. Social security and publicly funded health care by themselves account for about a quarter of total (consolidated) government expenditure in Canada.

20. In practice, there may be many other factors operating to bring about changes in expenditure in different categories but our calculations abstract from those in order to focus strictly on demographic influences. For a complete technical description, see Denton and Spencer, (1978 or 1985). For a purely theoretical model in which the specific age-dependence of different types of government expenditure is recognized, see Echevarria (1995).

21. Fougère and Mérette (1998), based on simulation analysis with their overlapping-generations endogenous growth model, note the upward pressure that population aging will place on government expenditures on health care services and public pension plans, but emphasise that government revenues from private tax-sheltered pension plans will offset that increase.

22. As the National Advisory Council on Aging (1991) put it, "The challenge of population aging is not easy for countries with a unitary system, let alone for a federation. Canadian governments at all three levels thus must display lucidity, flexibility, and collaboration if this challenge is to be met" (p. 17). David Foot (1984) made a similar point in an article that focussed on the 1980s but has relevance for today, and far into the future. He suggested that in the longer term his calculations "might be interpreted to indicate the pressure for fiscal centralization," because of the division of constitutional responsibilities and the differential effects of population aging on government programs for the old and the young (p. 412).

23. An interesting paper by Jacques Henripin (1994) deserves mention. Henripin's paper is a carefully crafted study of the "financial consequences" of population aging. It focusses on pension benefits, health costs, and education costs, and concludes that "One can expect large increases in public health costs and pension benefits that taxpayers will bear, and that will be only partially compensated by a reduction in education cost" (p. 78). It further argues that Fellegi (1988) and Denton, Feaver, and Spencer (1989) have got it wrong in their assumptions about the ameliorating effects of productivity increases in the health sector. We have already given our views on the narrowness of a health-pension-education focus so we turn to the issue of productivity. Productivity is notoriously difficult to measure, and especially so for the service sector of the economy in general, and for health care in particular. Henripin does not like our assumption that productivity will increase at the same rate in the health care sector as in the economy as a whole over the next several decades. We have, in fact, made various alternative assumptions about productivity growth (Denton and Spencer, 1985, for example) and found that even a modest rate would produce GNP or GDP growth that outweighed considerably the effects of population-induced growth on health care costs. No one can know what in fact will happen to productivity in the health care sector (or any other sector) but we think that assuming the same rate of growth as in the economy at large is about as reasonable an assumption as one can make. A point to note, perhaps, is that productivity gains can occur in the patient population as well as in the provision of treatment and diagnostic services. It can well be argued that considerable health care productivity growth will occur because of a rising level of general education and an increased awareness of health risks and how to avoid them. Increased public awareness of smoking risks is an important case in point.

24. As Disney (1996, p. 307) states, "There are serious crises in pay-as-you-go social insurance programs and in health care [in many developed countries], but these have little to do with aging." Also, as Lee and Skinner (1998) note in speaking of the situation with Medicare in the US, "In the shorter term, the Medicare crisis is not because of increasing numbers of old people. The crisis is because of increasing real per capita health care expenditures. Specific diseases are being treated more intensively and with ever greater levels of technology ... The increased cost of treating heart attacks has come from the increased use of surgical intervention, either through angioplasty ... or through bypass surgery. The cost per surgical procedure has actually declined. Nevertheless, surgery is now deemed appropriate for an ever-larger percentage of patients with heart attacks and ischemia."

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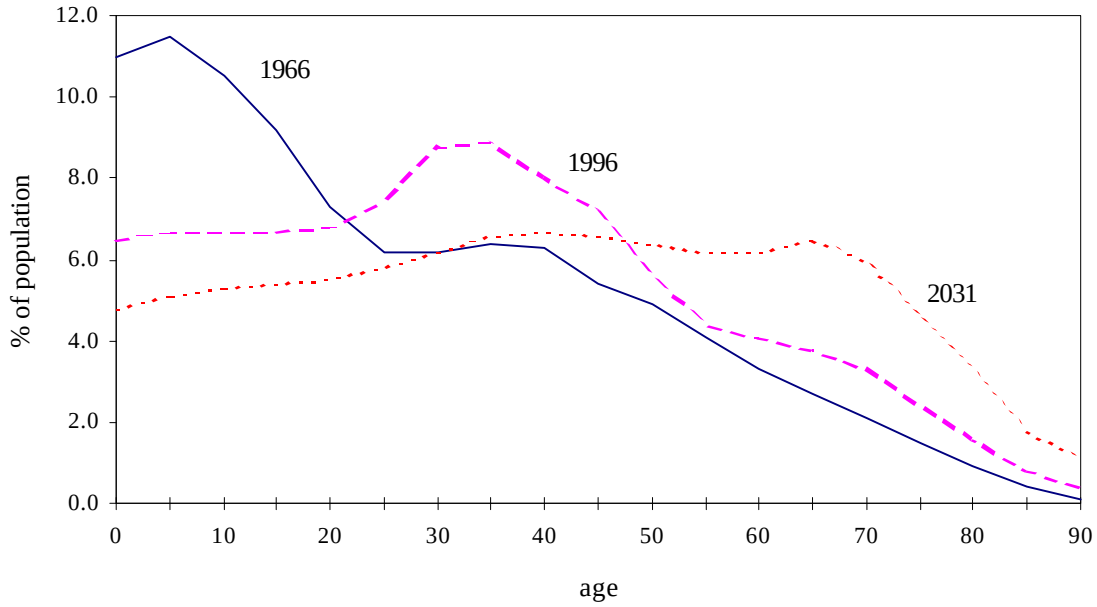
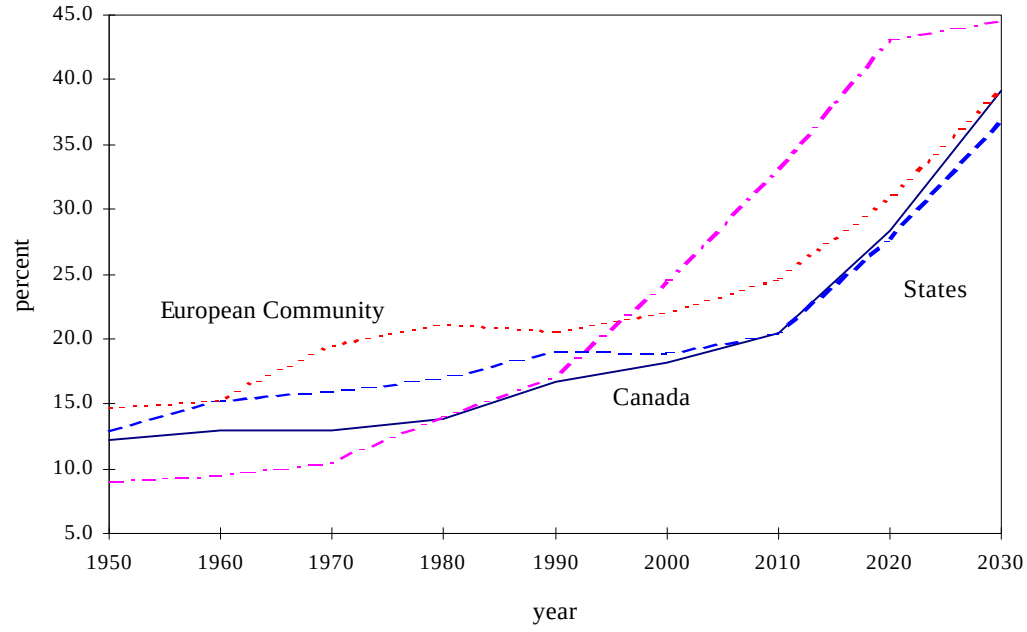
Figure 1: Age Distribution of the Population, Selected Years



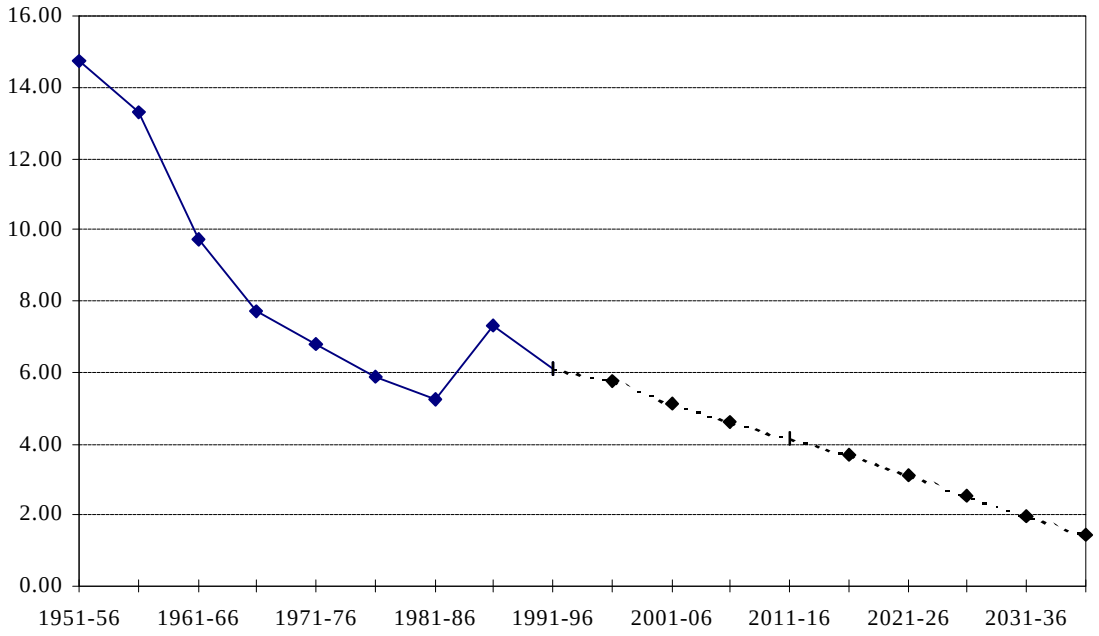
Note: The percentages refer to five-year age groups 0-4 through 85-89 and 90 and over.
Source: Population numbers for 1966 and 1996 from Statistics Canada and those for 2031 from Denton, Feaver, and Spencer (1998).

Figure 2: Actual and Projected Elderly Dependency Ratios, Selected Areas, 1950-2030



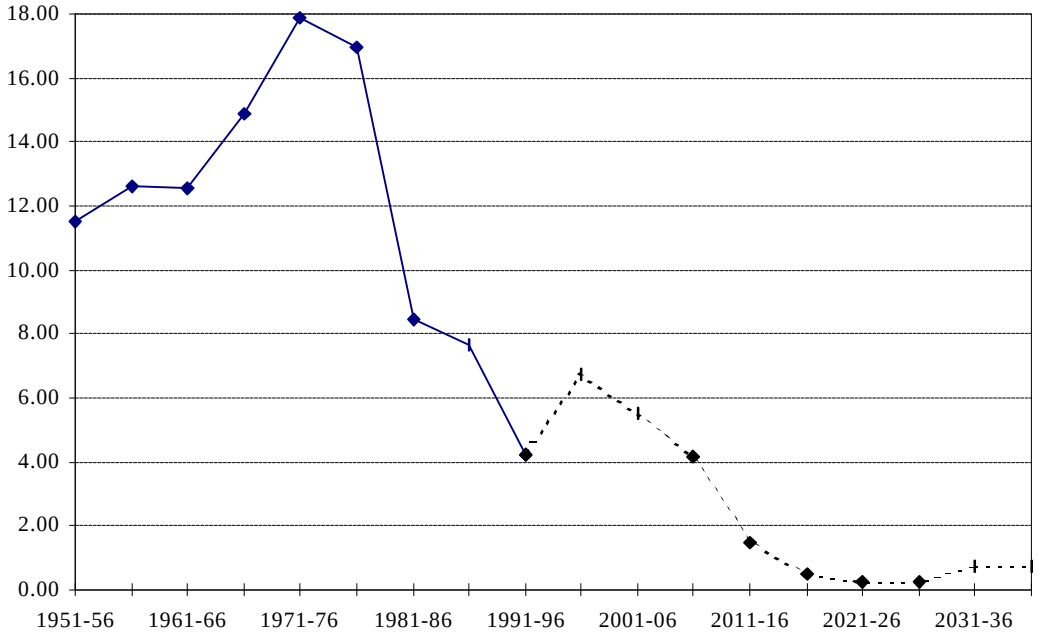
Source: OECD (1996, Table A3). The "elderly dependency ratio" is defined here as the ratio of the population 65 and over to the population 15-64.

Figure 3: Five-year Percentage Growth Rates: Population, 1951-56 to 2036-41



Note: Projected growth rates, represented by the broken line, are based on 'medium' assumptions.

Figure 4: Five-year Percentage Growth Rates: Labour Force, 1951-56 to 2036-41



Note: Projected growth rates, represented by the broken line, are based on 'medium' assumptions.

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